Conservation Resources
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THE MAKING OF A RANGE

THE MAKERS
WALKER & PRATT MFG. CO
BOSTON

MAKERS OF THE

CRAWFORD RANGES

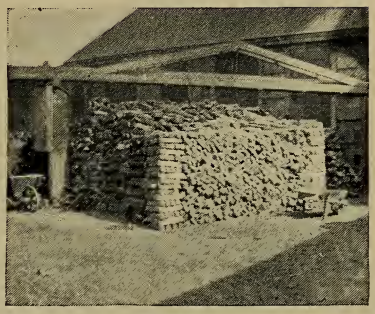
THE MOST THOROUGHLY MADE RANGES
IN THE WORLD

FACTORY AT WATERTOWN, MASS.
ESTABLISHED FORTY YEARS

PRINCIPAL OFFICE AND SALESROOM
31-35 UNION STREET, BOSTON, MASS.

AN HOUR IN A NEW ENGLAND STOVE FACTORY

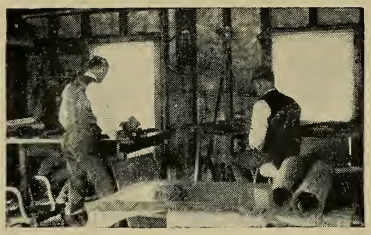
STOVES are made, you know, from pig iron. That comes to us from Pennsylvania, mostly; but some from the South — Alabama, Tennessee or Georgia. It is called "pig" iron because of the form in which we get it; rough pieces or "pigs" a yard long and three or four inches thick, each weighing a hundred pounds. Northern irons are stronger, usually, than Southern irons. We blend half a dozen brands to get just the right iron mixture for our work.



PILE OF PIG IRON

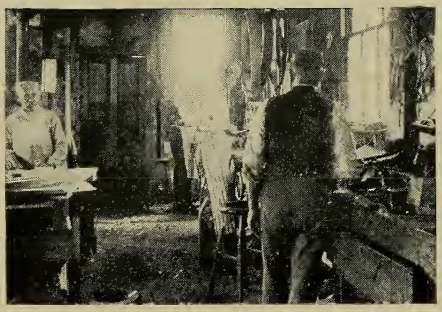
How to make pig iron into stoves, is our story.

First we make a pattern of each piece in the stove, a whole pattern-stove, of pine wood, usually. In making this wood pattern-stove we study the proportions for perfect operation; the appearance, design, form of each piece, to make the stove attractive and easy to sell; the shape and thickness of the parts to make them stand the heat and blows of use and misuse; the ease of putting the stove together; the way to get it apart if it should need repairing, and a dozen other things which must be thought of. All this requires study, experience, taste, skill and a "knack." It is a year, perhaps, after the designer begins, before we can offer a stove for sale.



DESIGNING ROOM

But this pattern-stove of wood cannot itself be used to make



VIEW IN PATTERN SHOP

other stoves from. It is too frail and dampness makes it warp and swell, so that the castings would differ — would not be exact duplicates. And, as we shall explain, *moist* sand is used to form the molds. So we make from the wood pattern-stove very carefully another stove of IRON, and the parts of this second stove we use as patterns in making the stoves we sell.

FINISHING IRON PATTERNS

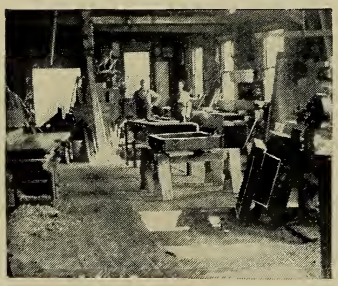
Now there is a curious thing about iron castings: the castings are always a little smaller than the pattern from which they are made. To put it differently, iron "shrinks" in casting and the amount of shrink is about one-eighth of an inch in a foot, or three-eighths of an inch in a yard.

PATTERN STOREHOUSE

Therefore the iron pattern-stove must be a little larger than the stove we want to make. The *wood* pattern-stove must be even larger, two "shrinks" large, one-quarter of an inch to the foot, three-quarters of an inch to the yard. If we did not remember this in making patterns, we should not produce stoves of a given size; for instance, with ovens twenty inches square on the bottom, which is a sort of standard among stove makers.

SHRINK RULES

To make this easy we have rules or measures which are like common rules except a little longer. Thus a "double-shrink" two-foot rule is 24½ inches long, but divided into twenty-four equal parts, for inches, like any other rule; each inch being of course a very little longer than a standard inch. We use such rules, either "single-shrink" or "double-shrink," in making drawings and measuring patterns.



FLASK SHOP

Having made the patterns

ready, of iron, perfectly smooth all over like polished glass — for this is necessary in making smooth castings — we brush them with wax to keep them from rusting, and then they are ready for the molders.

FLASKS PILED IN YARD

* * *

In the foundry we use "flasks" — not the glass kind, ours are of wood — wooden boxes, without tops or bottoms. Into these the sand is packed to make the molds. Common flasks are in two parts, the "nowel" and "cope." Cope means cover, of course, and is the part that covers the nowel. Let us try to explain.

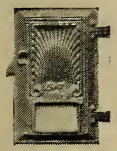


FIG. 1

Suppose we are to make a mold for a simple piece, like a small door. (Fig. 1.) The pattern-door, face up, is laid upon a board, called a "mold-board." (Fig. 2.) Then we lay the nowel upside

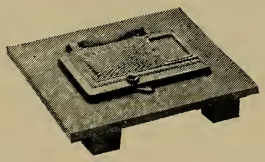


FIG. 2

down, on the mold-board, enclosing the pattern. (Fig. 3.)

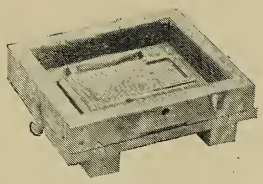
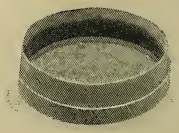


FIG. 3

Now the molder, with a "riddle," sifts fine, moist sand into the nowel until the pattern is covered, perhaps half an inch deep. Next he fills the nowel with unsifted sand and packs it down with his rammer. This sounds easy, but it isn't. The exact moisture, or "temper" of the sand, how hard to ram, the places to ram hard and the places to ram soft; these things are the molder's business — a part of it.



RIDDLE

After the nowel is rammed full, the sand is levelled off — "struck" off as the molders say — with a "strike" or straight edged piece of wood or iron. Another board, called the "bottom-board," is laid upon the nowel; and then the whole is turned over, nowel and both boards together. (Fig. 4.) The bottom-board is

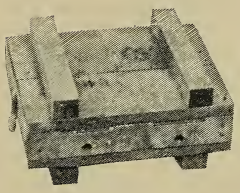


FIG. 4

underneath; the mold-board, now on top, is lifted off, and you may see the pattern lying face down in the closely packed sand. (Fig. 5.)

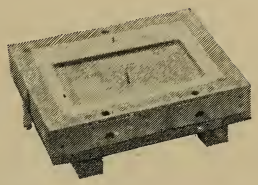


FIG. 5

Any loose sand is brushed away, and the top surface of the sand in the nowel is showered with dry "parting-sand." The parting-sand lodging on the pattern is blown off with a bellows. Next the empty cope is placed on the nowel, guided into place by two or three cast-iron pins, fitting holes in the edge of the nowel, and the cope, like the nowel, is filled with closely rammed sand. The pattern, of course, is entirely buried in the sand.

DRAWING THE PATTERN

The cope is now lifted off. The sand in the cope does not adhere to the sand in the nowel; that is prevented by the parting-sand. Then the pattern is "rapped" lightly with a mallet and carefully lifted or "drawn"

from its own impression in the sand. If the casting must have a nicely finished surface, a "facing" of powdered charcoal and black lead is shaken over the nowel part of the mold, and to press this facing smoothly into the sand the pattern is laid or "printed" back into the mold for a moment. All our molds for outside parts of stoves are "faced" and the patterns "printed" back in this way. The "face" side of the piece is usually the "nowel" side; we make castings face downward because impurities in the melted iron tend to rise, and the smooth side of a casting is the lower side, as it lies in the mold.

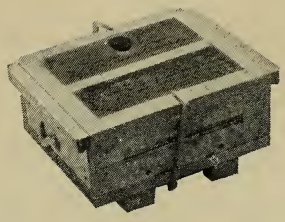


FIG. 6

The cope is replaced and clamped upon the nowel, leaving a hollow space, of course, just the shape of the pattern, ready to receive the melted iron. One thing, however, we have not described: how the melted iron enters the mold. Well, an inlet is arranged by the molder, and you can see the hole or "sprue" in the top of the sand, perhaps

an inch in diameter, a little larger at the top, into which the iron is poured. (Fig. 6.)

Now we have the mold ready for the melted iron.

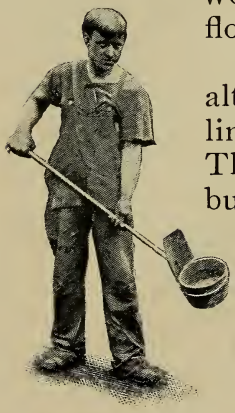
IN THE FOUNDRY - - BEFORE POURING-TIME

Using different flasks and bottom-boards, but the same mold-board and pattern, each molder covers his "floor" with molds like this. If large, difficult pieces, like range tops or bottoms, ten to sixteen flasks may be a day's work; if smaller pieces, twenty or thirty flasks, or perhaps as many as fifty or sixty flasks.

While the molders have been making molds, the melter,— "skipper" we used to call him —with his helpers, has been preparing the cupola furnace for the day's "melt." The cupola is an upright plate-iron cylinder or shell, five or six feet in diameter; its lower end is stopped by heavy hinged iron doors; the top or "stack" extends out through the roof. The shell of the cupola is lined with the best firebrick. The fuel and pig iron are thrown into the cupola at the "charging-door," a dozen feet above the floor, the cupola men working on a stage or "charging-floor" at the convenient height.

CUPOLA-STACK

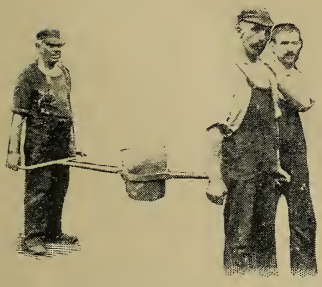
Coke and iron are "charged" in alternate layers, with pine kindlings at the bottom of the cupola. The fire is lighted about noon and burns slowly until about quarter past three in the afternoon. Then the blower is started, and the "wind" or blast begins. Soon the melted iron



MOLDER AND LADLE

CATCHING MELTED IRON

begins to "come down," as we say, and flows in a brilliant stream through a spout in the front of the cupola, near the bottom. This is the most picturesque part of our work. The liquid appears to be of the thickness of cream, and the color of fire; a bright yellow; almost white on a dark day.



BULL LADLE

The molders, in turn, "catch" the iron and carry it in ladles to their molds. For pouring heavy castings we use a "bull" ladle, carried by three men, and sometimes we use a "crane" ladle, lifted by a hoisting crane. We also use a "buggy" or two-wheeled cart, carrying five or six hundred pounds. For stove castings, however, we use mostly the "single-hand"

IRON-BUGGY

ladle, which holds about fifty pounds of melted iron.

Simple as it seems, pouring iron into molds for stove castings is anything but easy. When to pour fast, or slow, exactly when to stop, how hot or cool the iron, are some of the topics molders discuss. Not only the weight of liquid iron — it is about seven times as heavy as water — but its peculiar action upon entering the moist mold, serve to complicate the art of pouring.

Thin castings, like parts of stoves, cool in a few minutes after being "poured." Heavy pieces, like parts of furnaces or steam-heaters, which we also make, may require several hours. When the castings are cool enough, they are "shaken out" of the flasks, and piled at the end of the molder's floor. The sand is moistened anew so as to be of the proper "temper," mixed by being "cut" with a shovel, and left in a heap ready for the next day.

* * * *

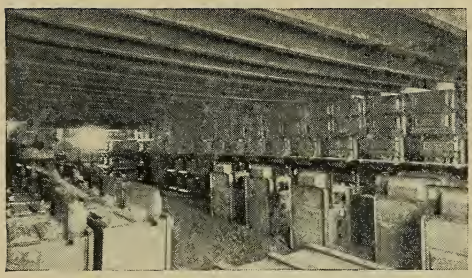
After the molding and pouring the processes are perhaps a little less interesting.

In the "scratch shop" the castings are cleaned by wire brushes or by "rattling" in revolving "tumbling barrels." Then the castings are sorted, weighed and carried to their respective bins. Some pieces go to the machine shop, others to the polishing and plating departments.

In the "mounting shop" the finished parts are fitted to make complete stoves. Drills and emery-wheels are used in mounting and fitting the plates. Emery-wheels whirling a thousand times a minute are useful tools, but they are far from quiet; the noise of a dozen wheels managed by experts is distracting, and the showers of sparks are dazzling; yet the men don't seem to mind it. The mounters work with the greatest accuracy, and it is largely upon the excellent fitting or mounting that the successful operation of a range depends.

ONE OF THE MOUNTING SHOPS

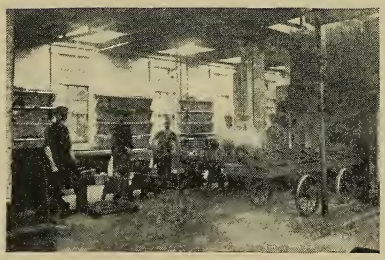
After passing a rigid inspection, the stoves are sent to the storehouse. Here they are piled three or four high, ready to be shipped anywhere, even to Africa; we send more than a thousand a year there.



PILE OF RANGES

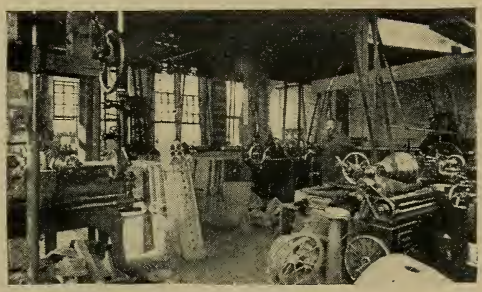
* * *

This story of the making of a stove must, of course, be very brief and far from complete. The core shop and its ovens, where cores for hollow castings are made and baked; the testing room, where hollow pieces like waterfronts are tested by water pressure at 150 pounds to the square inch; the machine shop, where castings are turned, planed, drilled or tapped; the sand house, where the Albany molding sand of a fine quality suitable for high grade castings is dried in ovens



IN THE CORE SHOP

and carefully bolted; the blacksmith shop, boiler house, engine and pump room, pattern storehouse and other interesting places, we cannot describe in detail here. Not the least important is the room where a sample bar of the iron melted each day is carefully examined to ascertain its shrinkage, and its breaking strength determined by an accurate testing machine.



MACHINE SHOP

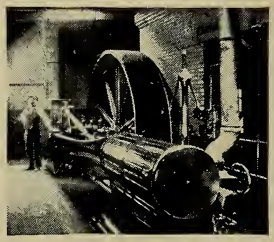
* * *

Our works have been established forty years; they are our pride; the basis of our reputation as stove makers. Whatever value there is in tradition, experience, skill, accumulated and handed down through these years — WE HAVE IT, and are using it in connection with the best materials, best tools, best appliances and best mechanics in the world. Our products, especially the well-known CRAWFORD RANGES, are therefore supe-

rior; often imitated, never excelled or even approached in quality. Our stoves are known wherever stoves are used; ask any foundryman about them.

* * * *

We would like to show you more about stove making. Come and see us—come about three o'clock and see the melted iron.



ENGINE ROOM

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FURNACES WATER-HEATERS

STEAM-HEATERS

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